



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
**REGION 10**  
**OREGON OPERATIONS OFFICE**  
805 SW Broadway, Suite 500  
Portland, Oregon 97205

July 22, 2009

Mr. Robert Wyatt  
Northwest Natural & Chairman, Lower Willamette Group  
220 Northwest Second Avenue  
Portland, Oregon 97209

Re: Portland Harbor Superfund Site; Administrative Order on Consent for Remedial Investigation and Feasibility Study; Docket No. CERCLA-10-2001-0240 – Revised Phase 2 Recalibration Results: Hydrodynamic Sedimentation Modeling for Lower Willamette River

Dear Mr. Wyatt:

EPA has reviewed the Revised Phase 2 Recalibration Results: Hydrodynamic Sedimentation Modeling for Lower Willamette River dated May 9, 2009. This report was prepared by WEST Consultants and Tetra Tech, Inc in association with Integral Consulting, Inc. EPA comments were prepared by Earl Hayter, with the U.S. Army Corps of Engineers Environmental Dredging Research Center and are attached to this letter.

Based on the attached comments, there appears to be significant problems with the approach used to calibrate and validate the sediment transport model and, as a result, the model does not appear to be technically defensible. In particular, there appears to be a number of instances where incorrect procedures were utilized in the calibration of the models. The procedures listed below are not correct:

1. Changing the gross erosion rates from those measured in the Sedflume tests;
2. Applying the Sedflume results to only the cohesive sediment portion of the sediment bed since Sedflume measures the gross erosion rates of both the cohesive and noncohesive sediment in the cores; and
3. Using the total bed shear stress to calculate the resuspension rate for noncohesive sediments. The grain shear stress should be used for both cohesive and noncohesive sediments.

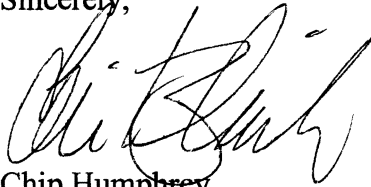
As a result of the incorrect procedures described above, the calibration and validation of the model should be revisited following incorporation of the attached comments. In addition, due to the impact on the simulated sediment transport in the Columbia River, a different

hydrodynamic boundary condition needs to be applied at the upstream boundary. Specifically, a flow hydrograph should be used for the upstream boundary condition in the upstream reach of the Columbia River instead of the radiation-separation condition. If necessary, this portion of the grid should be extended upstream in the Columbia to the location of a discharge gauging station.

As you are aware, a meeting has been scheduled for August 5, 2009 to discuss the Hydrodynamic Sedimentation Transport (HST) Model. We are interested in understanding, prior to the meeting, modifications to the HST model that the LWG is considering. In addition, an approach for revising the HST model that considers the overall project schedule should be developed during the meeting.

If you have any questions, please contact Chip Humphrey at (503) 326-2678 or Eric Blischke (503) 326-4006. All legal inquiries should be directed to Lori Cora at (206) 553-1115.

Sincerely,

A handwritten signature in black ink, appearing to read 'Chip Humphrey', is written over the printed name.

Chip Humphrey  
Eric Blischke  
Remedial Project Managers

cc: Greg Ulirsch, ATSDR  
Rob Neely, NOAA  
Ted Buerger, US Fish and Wildlife Service  
Preston Sleeper, Department of Interior  
Jim Anderson, DEQ  
Kurt Burkholder, Oregon DOJ  
David Farrer, Oregon Environmental Health Assessment Program  
Rick Keppler, Oregon Department of Fish and Wildlife  
Michael Karnosh, Confederated Tribes of Grand Ronde  
Tom Downey, Confederated Tribes of Siletz  
Audie Huber, Confederated Tribes of Umatilla  
Brian Cunningham, Confederated Tribes of Warm Springs  
Erin Madden, Nez Perce Tribe  
Rose Longoria, Confederated Tribes of Yakama Nation

**Attachment 1:**  
**Comments on: Portland Harbor RI/FS**  
**Revised Phase 2 Recalibration Results: Hydrodynamic Sedimentation Modeling for Lower**  
**Willamette River**

**General comment:**

Based on the collective specific comments given below, I do not find that the hydrodynamic sedimentation model for the Lower Willamette River is correctly calibrated and validated. In addition, because of the impact on the simulated sediment transport in the Columbia River, I believe that a different hydrodynamic boundary condition should be used for the upstream boundary in the Columbia. For these reasons, I do not believe that the results from this model should be used to drive the abiotic contaminated transport and fate hybrid model. Please feel free to give me a call if you want to discuss any of these comments.

**Specific comments:**

Sec 2.1.1, pg 11, 1 <sup>st</sup> full para	How were the effective diameters for size classes 2 – 4 determined? How was the bed sediment distribution given in Table 2-2 used in the modeling?
Sec. 2.1.2, pg 11, 1 <sup>st</sup> para, last sentence	Exactly how were the subsurface data used to supplement the Sedflume data?
Sec. 2.1.3, pg 13, last para	How were Eqs. 2.1 extended to the GeoSea STA data set “to estimate the bed properties at locations in the model domain where only sediment size distribution information is available”?
Sec. 2.1.5.1, pg 14, 2 <sup>nd</sup> para	I think these two sentences need to be added into the first paragraph and reworded as necessary. At present, the 1 <sup>st</sup> sentence refers to deep layers (bottom 5 layers) and the 2 <sup>nd</sup> sentence refers to the Sedflume cores which were used to specific bed properties of the upper 5 layers.
Sec. 2.1.5.1, pg 15, 3 <sup>rd</sup> para	How were the depth-varying values of the critical shear stresses, shown in Fig. 2-6, determined for use in EFDC?
Sec. 2.1.5.2, pg 17, 3 <sup>rd</sup> para	How was the core d <sub>50</sub> determined? Likewise, how was the cell d <sub>50</sub> determined?
Sec. 2.1.5.3, pg 17	I do not understand the last two sentences in this paragraph. Please reword or expand the description of specifying the bed initial conditions in the subsurface layers.
Sec. 2.1.5.3, pg 18, 2 <sup>nd</sup> para, 2 <sup>nd</sup> sentence	How were the cores split into sub-cores of similar properties? This is an important step, so please provide a detailed explanation.
Sec. 2.1.5.3, pg 18, 3 <sup>rd</sup> para, last sentence	Which three cores did not show cohesive sediment behavior?
Table 2-5	I might have missed this, but I do not see this table mentioned in the text.
Sec. 2.2.2, pg 19, 2 <sup>nd</sup> para	It is not unexpected that there is not a strong relationship between critical shear for erosion and bulk density. Based on my experience with cohesive sediment, such a strong relationship is more the exception than the rule.

Sec. 2.2.2, pg 20, 1 <sup>st</sup> full para	The method described in this paragraph in which the properties of Core 12 were applied to “all core subsurface layers” is not supported. Related to this, how were the critical shear stresses for resuspension in layers below 30 cm determined? This issue needs to be discussed, and then a revised procedure needs to be devised.
Sec. 3.1, 2 <sup>nd</sup> para, pg 22	I disagree with the statement that “the critical shear for deposition has an upper limit depending on the Sedflume core measured critical shear stress for erosion”. This is definitely not true for all fine-grain, i.e., cohesive, sediments. The upper limit of 0.95 Pa that was tested is larger (by a factor of at least three) than other upper limits I have seen referenced in the literature. I will check the cited reference by Hwang and Mehta (1989) to see if an explanation is given for the high upper limited they report (0.535 Pa).
Sec. 3.2, 1 <sup>st</sup> para, pg 23	What specifically is causing the excessive deposition (and quantify excessive) upstream of RM 9 in the middle section using Method 1?
Sec. 3.2, 2 <sup>nd</sup> para, pg 23	<p>The area between RM 1 and RM 11.8 is defined as the project area reach, which includes the designated RI study area from RM 1.9 to RM 11.8. Considering that Method 2 gives the best results in this area, why was Method 3 adopted?</p> <p>Looking at the numbers in Table 3-2, by what measure does Method 3 give the best overall results?</p>
Sec. 3.3, pg 23, 2 <sup>nd</sup> para, last sentence	Quantify how much better the results are using the Sedflume core data.
Sec. 4.1, pg 25, 2 <sup>nd</sup> para	<p>Lick’s ‘settling’ velocity equation should be given in the report.</p> <p>Describe method used to calculate the average settling velocity stated in this paragraph.</p> <p>Lick’s flocculation experiments were performed in a Couette flocculator in which the flow field was laminar. The results obtained from those experiments have not been shown to be valid in a natural, turbulent flow field such as the Lower Willamette River.</p>
Sec. 4.1, 3 <sup>rd</sup> para, pg 25	In my opinion, it is an incorrect modeling procedure to change the gross erosion rates measured in the Sedflume tests.
Sec. 4.2.1, pg 26	As stated above, it is incorrect sediment transport modeling methodology to change the measured erosion rates to calibrate the model.
Sec. 4.2.1.4, 2 <sup>nd</sup> para, pg 30	In my opinion, it is incorrect to apply the Sedflume results to only the cohesive sediment portion of the sediment bed since Sedflume measures the gross erosion rates of both the cohesive and noncohesive sediment in the cores.
Sec. 4.2.2, pg 31, 1 <sup>st</sup> para, 3 <sup>rd</sup> sentence	It is incorrect to apply the total bed shear stress to calculate the resuspension rate of sediment. The grain shear stress should be used to calculate the resuspension rate of both cohesive and noncohesive sediment. It is incorrect to use the total shear stress for one type of sediment (because “the grain shear stress associated with noncohesive sediments is too low”) and the grain shear stress for cohesive sediments.

Sec. 4.2.3	Because of the stated incorrect procedures applied to initialize and calibrate the model, the calibration of the model should be revisited.
Sec. 4.3	Because of the above comment on the model calibration, the validation of the model should be revisited as well.
Sec. 5.1.5.1, pg 42, 3 <sup>rd</sup> para, last sentence	It is stated that the 1.5 to 3 m range of simulated erosion depths using the calibrated model is more realistic. What physical evidence is there that there is this much erosion occurring in the stated locations?
Sec. 5.1.5.3, 2 <sup>nd</sup> para, pg 44	Because of the impact on the simulated sediment transport in the Columbia River, I believe that a different hydrodynamic boundary condition needs to be applied at the upstream boundary. Specifically, a flow hydrograph should be used for the upstream boundary condition in the upstream reach of the Columbia River instead of the radiation-separation condition. If necessary, this portion of the grid should be extended upstream in the Columbia to the location of a discharge gauging station.
Appendix D, pg 1, 2 <sup>nd</sup> para	Explain in detail how the adjusted bulk density is determined.
Appendix D, pg 3, above Eq. 11	Change “particular” to “particulate”.
Figs. 1 – 5	Either correlation coefficients or coefficients of determination should be included on these figures.